Airable RESEARCH LAB
WHERE SUSTAINABLE SOLUTIONS START

Soybean-Hull-Reinforced Polymers

A cost-efficient feedstock for increasing toughness and biodegradability

One of the most commonly used polymers, high-density polyethylene (HDPE) benefits from the use of sustainable additives that improve the product's toughness and biodegradability. Researchers from the University of Akron and Engineering Mechanics Corporation of Columbus (Emc²), with sponsorship from the Ohio Soybean Council, studied the inclusion of torrefied (carbonized at low temperature) soybean hulls (SBH) in HDPE.

TECHNICAL DATA

The research team developed polymer composites compounded with varying amounts of SBH and molded as tensile specimens to be tested using ASTM D638 to evaluate mechanical properties under tension.

RESULTS

Based on cost-efficiency, toughness, other mechanical properties (see the table), and biodegradability (% HDPE replacement), HDPE–SBH composite pellets were compounded and pelletized in the following proportions:

- Extrusion-grade HDPE (75%)
- Chemically compatibilized SBH, torrefied at 300°C for 20 minutes (25%)

These pellets can be shape-processed by injection molding or by other molding and extrusion processes to obtain marketable products. The torrefied soybean hulls can also be used with other polymers.

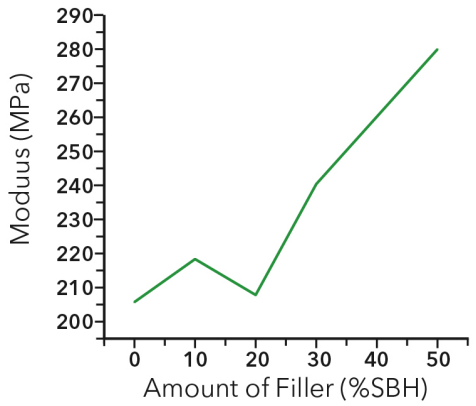
STATUS

Contact Airable Research Lab for more information about this research. Samples of 25 lb are available upon request.

COMPOSITE TENSILE RESULTS (five specimens each)

Composition (%wt SBH)	Modulus (MPa)	MaxStress (MPa)	Break Strain (mm/mm)
0	205.6967 ± 13.1946	46.3933 ± 0.3650	0.7793 ± 0.0231
10	218.1940 ± 28.2716	36.8918 ± 5.4176	0.5757 ± 0.0582
20	207.7425 ± 20.3185	25.7611 ± 2.0001	0.3822 ± 0.0259
30	240.6660 ± 23.0054	26.4586 ± 0.8135	0.2555 ± 0.0118
50	280.2100 ± 30.7668	20.0483 ± 0.5363	0.1167 ± 0.0163

Modulus vs Amount of Filler (%SBH)



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